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Psychological, emotional and social impairments are associated with adherence and healthcare spending in type 2 diabetic patients: an observational study

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Abstract. – OBJECTIVE: The aim of the present study was to assess the association among anxiety, depression, stress, social support and emotional abilities with adherence and healthcare spending in type 2 diabetic patients.

PATIENTS AND METHODS: Sixty-four patients were enrolled and completed: Interpersonal Processes of Care (IPC), 20-item Toronto Alexithymia Scale (TAS-20), Rapid Stress Assessment Scale (RSAS), Morisky Medication Adherence Scale (MMAS-4), International Physical Activity Questionnaire (IPAQ)-Short Form and a socio-anamnestic questionnaire regarding also the healthcare spending.

RESULTS: Mathematical linear regressions models were performed showing the predictive effects of: anxiety and social support scores (RSAS) on adherence levels (respectively *p* =. 019; *p* =. 016); adherence levels on anxiolytic use (*p* =.04); aggressiveness scores (RSAS) on the number of general check-ups (*p* =.031); TAS-20 and physician-patient communication (IPC) on the number of hospitalization days (respectively *p*=.001; *p*=.008); physician patient decision making (IPC) scores on physical activity (IPAQ) levels (p=.025); physical activity (IPAQ) on the number of medical examinations (*p*=.039).

CONCLUSIONS: An association among psychosocial impairment, adherence and healthcare spending was found. Future studies should investigate the effect of a brief psychological intervention in increasing adherence levels and reducing the healthcare spending in this clinical population.

Key Words:
Type-2 diabetes, Adherence, Psychological impairment, Social support, Healthcare spending.

Introduction

Diabetes mellitus is a growing epidemic whose prevalence has increased also in those countries that have adopted western lifestyle pattern[1]. In Italy more than three million people have diabetes and the 90% of them is affected by Type 2 Diabetes with substantial direct and indirect costs[2]. Direct costs are particularly related to long hospitalization due to acute and chronic complications and represent about the 60% of the total health expenditure associated to diabetes. Indirect costs are primarily related to the decrease or loss of patients' social productivity[3]. The economic impact could be explained by a poor adherence to treatment of diabetic patients. Adherence to treatment with oral hypoglycemic agents and accuracy in performing insulin therapy ranges respectively from 36% to 93% and from 20% to 80%; adherence to dietary recommendations is approximately the 65%, while less than 30% of the patients practices the recommended amount of physical exercise[3]. Previous studies[3,4] found an association between adherence to treatment and the healthcare costs related to diabetes, showing that a poor adherence was significantly correlated to higher healthcare utilization and costs. As regards the role of psychosocial dimensions on adherence, previous studies showed that higher difficulty in identifying and describing emotions was negatively correlated to poorer glycemic control[5,6]. Psychological factors, such as depression and anxiety, could also affect the adherence to treat-

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ment in diabetic patients. Previous studies showed that the depression rate in patients with diabetes was twice compared to general population[7]. Furthermore, depression was negatively associated with self-care, glycemic control, quality of life, health outcomes and adherence to treatment regimen, so contributing to the higher healthcare utilization and related costs[8,9]. Stressful experiences could also affect diabetes management[10]. Some studies[11,12] highlighted the importance of social support in the management of diabetes, showing that social networks and family behaviours affect self-managements capabilities and adherence to treatment. Similarly, the interpersonal processes between physicians and patients may influence patient outcomes including adherence to treatment recommendations[13]. In a recent systematic review was found that the one of the principal barriers related to the use of healthcare services were physician characteristics such as communication barriers, physician's manners, and lack of competence of physicians[14]. The aim of the present study was to assess the association among psychological, social and emotional variables with adherence levels and healthcare spending. The main hypothesis was that psychological, social and emotional impairments may be negatively associated with adherence and healthcare spending. Furthermore, a second hypothesis was that a lower level of adherence may predict a higher healthcare spending.

Patients and Methods

Procedure

Following local Ethical Committee approval, sixty-four type 2 diabetic patients were enrolled in the study. The research was carried out in collaboration with the medical staff of the Diabetology Department of the Policlinico Umberto I, Rome, Italy. Patients were consecutively enrolled between July 2015 and February 2016. The inclusion criteria were: age between 55 and 90 years, diagnosis of type 2 diabetes since at least one year, level of education no lower than primary school, Italian or foreign citizenship with knowledge of Italian language, and absence of psychopathology. All participants signed an informed consent. Anonymity was guaranteed by assigning a numerical code to each subject and the sensitive material was held in custody only by the researchers of the study. Each patient was asked to participate in the study during the day hospital visit with clinician at the Diabetology Department. The patients who accepted to participate were asked to have an interview in a quiet room with a psychologist in order to fill the questionnaires and to collect the data.

Measures

The administered self-report questionnaires were the following:

a) The Interpersonal Processes of Care (IPC) is a patient-reported instrument, assessing patient-physician interpersonal processes of care. The survey evaluates several sub-domains of communication, patient-centered decision making, and interpersonal style. It contains 29 items and the score is calculated on 4-point Likert scale ranging from 1 to 5. The reliability coefficient of the instrument ranges from 0.64 to 0.93[15].

b) 20-item Toronto Alexithymia Scale - 20 (TAS- 20) is a self-report instrument used to assess alexithymic levels, it contains 20 item which respond through a 5-point Likert scale (ranging from strongly disagree to strongly agree. The test specifically measures three distinct factors of alexithymia: difficulty in identifying feelings (DIF-F1), difficulty in describing feelings (DDF-F2), and externally oriented thinking (EOT-F3). The current version of the TAS-20 showed a high internal consistency (Cronbach's alpha = 0.81)[16].

c) The Rapid Stress Assessment Scale (RSAS) explores individual responses to stressful situations dividing the individual responses into five dimensions (clusters): depression, anxiety, somatization, aggressiveness and social support. It consists of 15 items: 9 of these are referred to the state of the person at the time of questionnaire completion, and the other 6 measure longitudinal variables related to the last six months. The RSAS was validated in an Italian sample showing a test-retest Pearson correlation coefficient between r=.70 and r=.92 (p<.0001)[17].

d) The Morisky Medication Adherence Scale (MMAS-4) is a self-report questionnaire, medication-taking behaviour scale, validated for hypertension but used also in diabetic patients [18]. The original version of the scale (MMAS-4) consists of four items with a scoring scheme of "Yes" = 0 and "No" = 1. The score of each item is summed to obtain a total scores ranging from low adherence to high adherence. The test showed a Chronbach's alpha of .55[19].

Table I. Results of multiple linear regression predicting Morisky Medication Adherence Scale and International Physical Activity Questionnaire.

Morisky Medication Adherence: R=.39 R^2=.15 Adjusted R^2=.13; F (2,61)=5.6 p<.006.	**b***	**S.E.**	**b**	**S.E.**	*t*	***p***
Anxiety (RSAS)	-0.28	0.12	-0.11	0.05	-2.40	.019
Social support (RSAS)	0.29	0.12	0.13	0.05	2.48	.016
International Physical Activity Questionnaire: R=.42 R^2=.18 Adjusted R^2=.14; F(3,60)=4.4 p<.007.	**b***	**S.E.**	**b**	**S.E.**	*t*	***p***
Difficulty Identifying Feelings (TAS-20)	0.01	0.18	6.89	169.49	0.04	.968
Difficulty Describing Feelings (TAS-20)	0.04	0.17	53.32	224.40	0.24	.813
Physician patient decision making (IPC)	0.29	0.12	397.11	171.90	2.31	.025

e) The International Physical Activity Questionnaire (IPAQ) - Short Form, investigates three specific types of activity: walking, moderate-intensity activities and vigorous intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity. The Cronbach's alpha on items about physical activity in the short version is 0.60[20].

f) The socio-demographic questionnaire was designed to collect information concerning participants' age, gender, diagnosis of type 2 diabetes since at least one year, level of education no lower than primary school. This questionnaire also includes 5 questions related to health care spending aimed to investigate the costs associated with diabetes over the last year such as frequency of general check-up, number of medical examinations, hospitalization days and use of antidepressants and anxiolytics.

Statistical Analysis

The number of patients included in the study was based on previous results and a priori power analysis using G*Power 3.1.5. (Kiel, Germany). The sample size calculation was performed on the basis of the primary endpoint (correlation between adherence and depression). It was estimated that a minimum of 50 patients (total sample n) would be required to detect correlation between adherence and psychological characteristics (Rho = -0.35) with a power of 80% assuming α=.05.

Correlation analyses (Pearson r) were conducted on the hypothesised associations. Linear regressions were performed in order to assess predictive factors for adherence to treatment and healthcare spending among those significant on the correlation analysis (p<.05). The analyses were performed using STATISTICA 9.0 (Tulsa, OK, USA).

Results

No patients were excluded from the study and the data of sixty-four type 2 diabetic patients (mean age 67 ± 11 years, 44 males and 20 females) were analyzed.

Correlation analyses revealed that anxiety (-.26; p=.035) and social support scores (RSAS) (.27; p=.028) were significantly related to Morisky Medication Adherence scores; TAS-20 difficulty in identifying feelings (-.26; p=.038), difficulty in describing feelings (-.25; p=.045) and IPC physician-patient decision-making scores (.32; p=.011) were significantly related to physical activity scores (IPAQ).

Mathematical linear regressions models confirmed the predictive effect of anxiety (p=.019) and social support (RSAS) (p=.016) on Morisky Medication Adherence scores (R=39 R^2=.15 Adjusted R^2=.13; F(2,61)=5.6; p<.006); while only physician-patient decision making (IPC) (p=0.025) showed a predictive effect on physical activity questionnaire scores (R=.42 R^2=.18 Adjusted R^2=.14; F(3,60)=4.4; p<.007 (Table I). Also adherence variables were correlated with healthcare spending variables. More specifically, Morisky Medication Adherence was significantly correlated to anxiolytics use (-.26; p=.040); physical activity scores were significantly correlated to the number of medical examinations (-.26; p=.039). Mathematical linear regressions models showed a predictive effect of Morisky Medication Adherence scores (p=0.04) on anxiolytic use (R=.26 R^2=.07 Adjusted R^2=.05; F(1,62)=4.4; p<.040), and also the predictive effect of physi-

Table II. Results of multiple linear regression predicting healthcare spending variables.

General check-up: R=.45 R²=.21 Adjusted R²=.17; F (3,60)=5.2 p<.003.	**b***	**S.E.**	**b**	**S.E.**	*t*	***p***
Anxiety (RSAS)	-0.20	0.20	-0.02	0.02	-1.01	.316
Depression (RSAS)	0.31	0.18	0.03	0.02	1.69	.097
Aggressiveness (RSAS)	0.36	0.16	0.03	0.01	2.21	.031
Hospitalization days: R=.51 R²=.26 Adjusted R²=.23; F (2,61)=10.6 *p*<.000.	**b***	**S.E.**	**b**	**S.E.**	*t*	***p***
TAS-20 total	0.37	0.11	0.21	0.06	3.34	.001
Physician patient communication (IPC)	-0.31	0.11	-0.23	0.08	-2.76	.008

cal activity scores (IPAQ) (0.039) on the number of medical examinations (R=.26 R²=.07 Adjusted R²=.05; F(1,62)=4.4; $p<.04$).

Finally, psychological, emotional, and social variables were also correlated with healthcare spending variables. Anxiety (.31; $p=.013$), depression (.38; $p=.002$) and aggressiveness scores (RSAS) (.32; $p=.011$) were related to the number of general check-up. TAS-20 total and externally oriented thinking were positively correlated with the number of hospitalization days (.41; $p=.001$ and .31; $p=.011$, respectively) while Physician-patient communication (IPC) showed a negative correlation to the number of hospitalization days (-.35; $p=.015$). Mathematical linear regressions models highlighted that only aggressiveness (RSAS) showed a predictive effect on the number of general check-up, and that TAS-20 total score and physician-patient communication (IPC) showed a predictive effect on the number of hospitalization days (Table II).

Discussion

The main finding of the present study was that a greater emotional, social, and psychological impairment was associated to a lower adherence to the treatment in patients with type-2 diabetes. Moreover, the lower adherence to the treatment was associated with a higher healthcare spending. Finally, greater emotional and social impairments were associated with a greater healthcare spending. Specifically, higher level of anxiety, lower level of perceived social support and higher difficulty in describing emotions predicted a lower adherence to treatment. These findings confirmed the results of previous studies which highlighted that emotional impairment, higher scores of anxiety and lower levels of perceived social support predicted poor adherence to the treatment in diabetic patients as well as in other chronic diseases[6,21,22]. It was interesting that higher perception of decision making shared with the physician was associated with a greater physical activity. In diabetic patient, practicing physical activities, as well as following a specific diet regimen, could have a relevant influence on glycemic control and on the prevention of possible complications[22]. This finding confirms the result of a previous study highlighting the impact of a positive relationship between patient and physician on treatment adherence in diabetic patients[23]. Sharing the decision-making process with the physician and establishing a good relationship with him represents an element that can help the processes of care and the adherence to physician' recommendations. In the present study, lower levels of adherence to treatment predicted higher healthcare costs regarding hospitalization duration (days) and use of anxiolytics. These findings confirm previous studies highlighting that lower levels of adherence to the treatment were associated with greater healthcare costs[3]. It is conceivable that less adherent diabetic patients are more prone to develop acute and chronic complications that lead to longer hospitalization. Moreover, the complications can influence patient's anxiety favoring the use of anxiolytics. Another result of the study showed that lower physical activity predicted greater recourse to medical examinations. It is conceivable that inactive patients are more prone to develop acute and chronic complications and, consequently, they ask for higher number of medical examinations. In the present study it can also be note the significant associations between psychological variables and healthcare spending: higher levels of aggressiveness and somatization predicted higher number of general check-ups. In previous studies somatization was associated with increased use of hospital services[24,25]. These findings highlight the link between psychological variables and

healthcare costs, suggesting that somatization may increase the use of healthcare service because of the subjectively perceived symptoms. Moreover, aggressiveness seems to have an influence on diabetes care causing greater distress, as shown in a previous study[26]. Furthermore, greater emotional impairment (high alexithymia total scores) was predictive of a substantial increase in hospitalization days. This finding is consistent with previous studies where higher level of alexithymia was associated with poorer glycaemic control in diabetic patients[6] and with poorer adherence to the treatment in renal transplanted patients[27,28]. The difficulty in identifying and describing feelings may have a negative effect on self-care behaviors, contributing to poor glycemic control or poor adherence to medical prescriptions. Interestingly, physician-patient communication quality was negatively correlated with the number of hospitalization days. This finding confirms previous studies where the involvement of the patients in treatment decisions and a positive physician-patient communication was able to predict a shorter duration of hospitalization[3]. The present study has an important limitation: the values of adherence and healthcare spending were collected using self-report questionnaire. It would have been helpful in answering the research question to having access both to biological markers associated to adherence and spending indicators from national health archives. In a future study it should be planned.

Conclusions

We showed an association between psychological dimensions, adherence and healthcare spending relevant for physicians and clinicians who work in this field. As new question arising from these findings, the importance to investigate the effectiveness of psychological intervention in increasing the adherence to treatment and psychosocial wellbeing and in reducing the healthcare costs in diabetic patients emerged.

Conflict of Interest

The Authors declare that they have no conflict of interest.

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